

"Goodbye Dolly?" The ethics of human cloning

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Abstract

The ethical implications of human clones have been much alluded to, but have seldom been examined with any rigour. This paper examines the possible uses and abuses of human cloning and draws out the principal ethical dimensions, both of what might be done and its meaning. The paper examines some of the major public and official responses to cloning by authorities such as President Clinton, the World Health Organisation, the European parliament, UNESCO, and others and reveals their inadequacies as foundations for a coherent public policy on human cloning. The paper ends by defending a conception of reproductive rights or "procreative autonomy" which shows human cloning to be not inconsistent with human rights and dignity.

The recent announcement of a birth¹ in the press heralds an event probably unparalleled for two millennia and has highlighted the impact of the genetic revolution on our lives and personal choices. More importantly perhaps, it raises questions about the legitimacy of the sorts of control individuals and society purport to exercise over something, which while it must sound portentous, is nothing less than human destiny. This birth, that of "Dolly", the cloned sheep, is also illustrative of the responsibilities of science and scientists to the communities in which they live and which they serve, and of the public anxiety that sensational scientific achievements sometimes provokes.

The ethical implications of human clones have been much alluded to, but have seldom been examined with any rigour. Here I will examine the possible uses and abuses of human cloning and draw out the principal ethical dimensions, both of what might be done and its meaning, and of public and official responses.

There are two rather different techniques available for cloning individuals. One is by nuclear substitution, the technique used to create Dolly, and the

other is by cell mass division or "embryo splitting". We'll start with cell mass division because this is the only technique for cloning that has, as yet, been used in humans.

Cell mass division

Although the technique of cloning embryos by cell mass division has, for some time been used extensively in animal models, it was used as a way of multiplying human embryos for the first time in October 1993 when Jerry Hall and Robert Stillman² at George Washington Medical Centre cloned human embryos by splitting early two- to eight-cell embryos into single embryo cells. Among other uses, cloning by cell mass division or embryo splitting could be used to provide a "twin" embryo for biopsy, permitting an embryo undamaged by invasive procedures to be available for implantation following the result of the biopsy on its twin, or to increase the number of embryos available for implantation in the treatment of infertility.³ To what extent is such a practice unethical?

Individuals, multiples and genetic variation

Cloning does not produce identical copies of the same individual person. It can only produce identical copies of the same genotype. Our experience of identical twins demonstrates that each is a separate individual with his or her own character, preferences and so on. Although there is some evidence of striking similarities with respect to these factors in twins, there is no question but that each twin is a distinct individual, as independent and as free as is anyone else. To clone Bill Clinton is not to create multiple Presidents of the United States. Artificial clones do not raise any difficulties not raised by the phenomenon of "natural" twins. We do not feel apprehensive when natural twins are born, why should we when twins are deliberately created?

If the objection to cloning is to the creation of identical individuals separated in time, (because the twin embryos might be implanted in different cycles, perhaps even years apart), it is a weak one at best.

Key words

Cloning; Dolly; human dignity; procreative autonomy, human rights.

We should remember that such twins will be "identical" in the sense that they will each have the same genotype, but they will never (unlike some but by no means all natural monozygotic twins) be identical in the more familiar sense of looking identical at the same moment in time. If we think of expected similarities in character, tastes and so on, then the same is true. The further separated in time, the less likely they are to have similarities of *character* (the more different the environment, the more different environmental influence on individuality).

The significant ethical issue here is whether it would be morally defensible, by outlawing the creation of clones by cell mass division, to deny a woman the chance to have the child she desperately seeks. If this procedure would enable a woman to create a sufficient number of embryos to give her a reasonable chance of successfully implanting one or two of them, then the objections to it would have to be weighty indeed. If pre-implantation testing by cell biopsy might damage the embryo to be implanted, would it be defensible to prefer this to testing a clone, if technology permits such a clone to be created without damage, by separating a cell or two from the embryonic cell mass? If we assume each procedure to have been perfected and to be equally safe, we must ask what the ethical difference would be between taking a cell for cell biopsy and destroying it thereafter, and taking a cell to create a clone, and then destroying the clone? The answer can only be that destroying the cloned embryo would constitute a waste of human potential. But this same potential is wasted whenever an embryo is not implanted.

Nuclear substitution: the birth of Dolly

This technique involves (crudely described) deleting the nucleus of an egg cell and substituting the nucleus taken from the cell of another individual. This can be done using cells from an adult. The first viable offspring produced from fetal and adult mammalian cells was reported from an Edinburgh-based group in *Nature* on February 27, 1997.⁴ The event caused an international sensation and was widely reported in the world press. President Clinton of the United States called for an investigation into the ethics of such procedures and announced a moratorium on public spending on human cloning; the British Nobel Prize winner, Joseph Rotblat, described it as science out of control, creating "a means of mass destruction",⁵ and the German newspaper *Die Welt*, evoked the Third Reich, commenting: "The cloning of human beings would fit precisely into Adolph Hitler's world view".⁶

More sober commentators were similarly panicked into instant reaction. Dr Hiroshi Nakajima, Director General of the World Health Organisation said: "WHO considers the use of cloning for the replication of human individuals to

be ethically unacceptable as it would violate some of the basic principles which govern medically assisted procreation. These include respect for the dignity of the human being and protection of the security of human genetic material".⁷ The World Health Organisation followed up the line taken by Nakajima with a resolution of the Fiftieth World Health Assembly which saw fit to affirm "that the use of cloning for the replication of human individuals is ethically unacceptable and contrary to human integrity and morality".⁸ Federico Mayor of UNESCO, equally quick off the mark, commented: "Human beings must not be cloned under any circumstances. Moreover, UNESCO's International Bioethics Committee (IBC), which has been reflecting on the ethics of scientific progress, has maintained that the human genome must be preserved as common heritage of humanity".⁹

The European parliament rushed through a resolution on cloning, the preamble of which asserted, (paragraph B):

"[T]he cloning of human beings . . . , cannot under any circumstances be justified or tolerated by any society, because it is a serious violation of fundamental human rights and is contrary to the principle of equality of human beings as it permits a eugenic and racist selection of the human race, it offends against human dignity and it requires experimentation on humans," And which went on to claim that, (clause 1) "each individual has a right to his or her own genetic identity and that human cloning is, and must continue to be, prohibited".¹⁰

These statements are, perhaps un-surprisingly, thin on argument and rationale; they appear to have been plucked from the air to justify an instant reaction. There are vague references to "human rights" or "basic principles" with little or no attempt to explain what these principles are, or to indicate how they might apply to cloning. The WHO statement, for example, refers to the basic principles which govern human reproduction and singles out "respect for the dignity of the human being" and "protection of the security of genetic material". How, we are entitled to ask, is the security of genetic material compromised? Is it less secure when inserted with precision by scientists, or when spread around with the characteristic negligence of the average human male?¹¹

Human dignity

Appeals to human dignity, on the other hand, while universally attractive, are comprehensively vague and deserve separate attention. A first question to ask when the idea of human dignity is invoked is: whose dignity is attacked and how? Is it the duplication of a large part of the genome that is supposed to constitute the attack on human dignity? If so we might legitimately ask whether and how the dignity

of a natural twin is threatened by the existence of her sister? The notion of human dignity is often also linked to Kantian ethics. A typical example, and one that attempts to provide some basis for objections to cloning based on human dignity, was Axel Kahn's invocation of this principle in his commentary on cloning in *Nature*.¹²

"The creation of human clones solely for spare cell lines would, from a philosophical point of view, be in obvious contradiction to the principle expressed by Emmanuel Kant: that of human dignity. This principle demands that an individual – and I would extend this to read human life – should never be thought of as a means, but always also as an end. Creating human life for the sole purpose of preparing therapeutic material would clearly not be for the dignity of the life created."

The Kantian principle, crudely invoked as it usually is without any qualification or gloss, is seldom helpful in medical or bio-science contexts. As formulated by Kahn, for example, it would outlaw blood transfusions. The beneficiary of blood donation, neither knowing of, nor usually caring about, the anonymous donor uses the blood (and its' donor) simply as a means to her own ends. It would also outlaw abortions to protect the life or health of the mother.

Instrumentalization

This idea of using individuals as a means to the purposes of others is sometimes termed "instrumentalization". Applying this idea coherently or consistently is not easy! If someone wants to have children in order to continue their genetic line do they act instrumentally? Where, as is standard practice in *in vitro* fertilisation (IVF), spare embryos are created, are these embryos created instrumentally? If not how do they differ from embryos created by embryo splitting for use in assisted reproduction?¹³

Kahn responded in the journal *Nature* to these objections.¹⁴ He reminds us, rightly, that Kant's famous principle states: "respect for human dignity requires that an individual is *never* used . . . *exclusively* as a means" and suggests that I have ignored the crucial use of the term "exclusively". I did not of course, and I'm happy with Kahn's reformulation of the principle. It is not that Kant's principle does not have powerful intuitive force, but that it is so vague and so open to selective interpretation and its scope for application is consequently so limited, that its utility as one of the "fundamental principles of modern bioethical thought", as Kahn describes it, is virtually zero.

Kahn himself rightly points out that debates concerning the moral status of the human embryo are debates about whether embryos fall within the *scope* of Kant's or indeed any other moral principles

concerning persons; so the principle itself is not illuminating in this context. Applied to the creation of individuals which are, or will become autonomous, it has limited application. True the Kantian principle rules out slavery, but so do a range of other principles based on autonomy and rights. If you are interested in the ethics of creating people then, so long as existence is in the created individual's own best interests, and the individual will have the capacity for autonomy like any other, then the motives for which the individual was created are either morally irrelevant or subordinate to other moral considerations. So that even where, for example, a child is engendered exclusively to provide "a son and heir" (as so often in so many cultures) it is unclear how or whether Kant's principle applies. Either other motives are also attributed to the parent to square parental purposes with Kant, or the child's eventual autonomy, and its clear and substantial interest in or benefit from existence, take precedence over the comparatively trivial issue of parental motives. Either way the "fundamental principle of modern bioethical thought" is unhelpful and debates about whether or not an individual has been used *exclusively* as a means are sterile and usually irresolvable.

We noted earlier the possibility of using embryo splitting to allow genetic and other screening by embryo biopsy. One embryo could be tested and then destroyed to ascertain the health and genetic status of the remaining clones. Again, an objection often voiced to this is that it would violate the Kantian principle, and that "one twin would be destroyed for the sake of another".

This is a bizarre and misleading objection both to using cell mass division to create clones for screening purposes, and to creating clones by nuclear substitution to generate spare cell lines. It is surely ethically dubious to object to one embryo being sacrificed for the sake of another, but not to object to it being sacrificed for nothing. In *in vitro* fertilisation, for example, it is, in the United Kingdom, currently regarded as good practice to store spare embryos for future use by the mother or for disposal at her direction, either to other women who require donor embryos, or for research, or simply to be destroyed. It cannot be morally worse to use an embryo to provide information about its sibling, than to use it for more abstract research or simply to destroy it. If it is permissible to use early embryos for research or to destroy them, their use in genetic and other health testing is surely also permissible. The same would surely go for their use in creating cell lines for therapeutic purposes.

It is better to do good

A moral principle, that has at least as much intuitive force as that recommended by Kant, is that it is better to do some good than to do no good. It

cannot, from the ethical point of view, be better or more moral to waste human material that could be used for therapeutic purposes, than to use it to do good. And I cannot but think that if it is right to *use* embryos for research or therapy then it is also right to *produce* them for such purposes.¹⁵ Kant's prohibition does after all refer principally to use. Of course some will think that the embryo is a full member of the moral community with all the rights and protections possessed by Kant himself. While this is a tenable position, it is not one held by any society which permits abortion, post-coital contraception, or research with human embryos.

The UNESCO approach to cloning is scarcely more coherent than that of WHO; how does cloning affect "the preservation of the human genome as common heritage of humanity"? Does this mean that the human genome must be "preserved intact", that is without variation, or does it mean simply that it must not be "reproduced a-sexually"? Cloning cannot be said to impact on the variability of the human genome, it merely repeats one infinitely small part of it, a part that is repeated at a natural rate of about 3.5 per thousand births.¹⁶

Genetic variability

So many of the fears expressed about cloning, and indeed about genetic engineering more generally, invoke the idea of the effect on the gene pool or upon genetic variability or assert the sanctity of the human genome as a common resource or heritage. It is very difficult to understand what is allegedly at stake here. The issue of genetic variation need not detain us long. The numbers of twins produced by cloning will always be so small compared to the human gene pool in totality, that the effect on the variation of the human gene pool will be vanishingly small. We can say with confidence that the human genome and the human population were not threatened at the start of the present millennium in the year AD one, and yet the world population was then perhaps one per cent of what it is today. Natural species are usually said to be endangered when the population falls to about one thousand breeding individuals; by these standards fears for humankind and its genome may be said to have been somewhat exaggerated.¹⁷

The resolution of the European parliament goes into slightly more detail; having repeated the, now mandatory, waft in the direction of fundamental human rights and human dignity, it actually produces an argument. It suggests that cloning violates the principal of equality, "as it permits a eugenic and racist selection of the human race". Well, so does prenatal, and pre-implantation screening, not to mention egg donation, sperm donation, surrogacy, abortion and human preference in choice of sexual partner. The fact that a technique could be abused does not constitute an argument against the technique, unless there is no prospect of preventing

the abuse or wrongful use. To ban cloning on the grounds that it might be used for racist purposes is tantamount to saying that sexual intercourse should be prohibited because it permits the possibility of rape.

Genetic identity

The second principle appealed to by the European parliament states, that "each individual has a right to his or her own genetic identity". Leaving aside the inevitable contribution of mitochondrial DNA,¹⁸ we have seen that, as in the case of natural identical twins, genetic identity is not an essential component of personal identity¹⁹ nor is it necessary for "individuality". Moreover, unless genetic identity is required either for personal identity, or for individuality, it is not clear why there should be a right to such a thing. But if there is, what are we to do about the rights of identical twins?

Suppose there came into being a life-threatening (or even disabling) condition that affected pregnant women and that there was an effective treatment, the only side effect of which was that it caused the embryo to divide, resulting in twins. Would the existence of the supposed right conjured up by the European parliament mean that the therapy should be outlawed? Suppose that an effective vaccine for HIV was developed which had the effect of doubling the natural twinning rate; would this be a violation of fundamental human rights? Are we to foreclose the possible benefits to be derived from human cloning on so flimsy a basis? We should recall that the natural occurrence of monozygotic (identical) twins is one in 270 pregnancies. This means that in the United Kingdom, with a population of about 58 million, over 200 thousand such pregnancies have occurred. How are we to regard human rights violations on such a grand scale?

A right to parents

The apparently overwhelming imperative to identify some right that is violated by human cloning sometimes expresses itself in the assertion of "a right to have two parents" or as "the right to be the product of the mixture of the genes of two individuals". These are on the face of it highly artificial and problematic rights – where have they sprung from, save from a desperate attempt to conjure some rights that have been violated by cloning? However, let's take them seriously for a moment and grant that they have some force. Are they necessarily violated by the nuclear transfer technique?

If the right to have two parents is understood to be the right to have two social parents, then it is of course only violated by cloning if the family identified as the one to rear the resulting child is a one-parent family. This is not of course necessarily any more likely a result of cloning, than of the use of any

of the other new reproductive technologies (or indeed of sexual reproduction). Moreover if there is such a right, it is widely violated, creating countless "victims", and there is no significant evidence of any enduring harm from the violation of this supposed right. Indeed war widows throughout the world would find its assertion highly offensive.

If, on the other hand we interpret a right to two parents as the right to be the product of the mixture of the genes of two individuals, then the supposition that this right is violated when the nucleus of the cell of one individual is inserted into the de-nucleated egg of another, is false in the way this claim is usually understood. There is at least one sense in which a right expressed in this form might be violated by cloning, but not in any way which has force as an objection. Firstly it is false to think that the clone is the genetic child of the nucleus donor. It is not. The clone is the twin brother or sister of the nucleus donor and the genetic offspring of the nucleus donor's own parents. Thus this type of cloned individual is, and always must be, the genetic child of two separate genotypes, of two genetically different individuals, however often it is cloned or re-cloned.

Two parents good, three parents better

However, the supposed right to be the product of two separate individuals is perhaps violated by cloning in a novel way. The de-nucleated egg contains mitochondrial DNA – genes from the female whose egg it is. The inevitable presence of the mitochondrial genome of the egg donor, means that the genetic inheritance of clones is in fact richer than that of other individuals, richer in the sense of being more variously derived.²⁰ This can be important if the nucleus donor is subject to mitochondrial diseases inherited from his or her mother and wants a child genetically related to her that will be free of these diseases. How this affects alleged rights to particular combinations of "parents" is more difficult to imagine, and perhaps underlines the confused nature of such claims.

What good is cloning?

One major reason for developing cloning in animals is said to be⁴ to permit the study of genetic diseases and indeed genetic development more generally. Whether or not there would be major advantages in human cloning by nuclear substitution is not yet clear. Certainly it would enable some infertile people to have children genetically related to them, it offers the prospect, as we have noted, of preventing some diseases caused by mitochondrial DNA, and could help "carriers" of X-linked and autosomal recessive disorders to have their own genetic children without risk of passing on the disease. It is also possible that cloning could be used for the creation of "spare parts" by for example, growing stem cells for

particular cell types from non-diseased parts of an adult.

Any attempt to use this technique in the United Kingdom, is widely thought to be illegal. Whether it would in fact be illegal might turn on whether it is plausible to regard such cloning as the product of "fertilisation". Apparently only fertilised embryos are covered by the *Human Fertilisation and Embryology Act 1990*.²¹ The technique used in Edinburgh which involves deleting the nucleus of an unfertilised egg and then substituting a cell nucleus from an existing individual, by-passes what is normally considered to be fertilisation completely and may therefore turn out not to be covered by existing legislation. On the other hand, if as seems logical, we consider "fertilisation" as the moment when all forty-six chromosomes are present and the zygote is formed the problem does not arise.

The unease caused by Dolly's birth may be due to the fact that it was just such a technique that informed the plot of the film "The Boys from Brazil" in which Hitler's genotype was cloned to produce a fuhrer for the future. The prospect of limitless numbers of clones of Hitler is rightly disturbing. However, the numbers of clones that could be produced of any one genotype will, for the foreseeable future, be limited not by the number of copies that could be made of one genotype (using serial nuclear transfer techniques 470 copies of a single nuclear gene in cattle have been reported),²² but by the availability of host human mothers.²³ Mass production in any democracy could therefore scarcely be envisaged. Moreover, the futility of any such attempt is obvious. Hitler's genotype might conceivably produce a "gonadically challenged" individual of limited stature, but reliability in producing an evil and vicious megalomaniac is far more problematic, for reasons already noted in our consideration of cloning by cell mass division.

Dolly collapses the divide between germ and somatic cells

There are some interesting implications of cloning by nuclear substitution (which have been clear since frogs were cloned by this method in the 1950s) which have not apparently been noticed.²⁴ There is currently a world-wide moratorium on manipulation of the human germ line, while therapeutic somatic line interventions are, in principle, permitted.¹³ However, inserting the mature nucleus of an adult cell into a de-nucleated egg turns the cells thus formed into germ line cells. This has three important effects. First, it effectively eradicates the firm divide between germ line and somatic line nuclei because each adult cell nucleus is in principle "translatable" into a germ line cell nucleus by transferring its nucleus and creating a clone. Secondly, it permits somatic line modifications to human cells to become germ line modifications. Suppose you permanently

insert a normal copy of the adenosine deaminase gene into the bone marrow cells of an individual suffering from severe combined immuno-deficiency (which affects the so called "bubble boy" who has to live in a protective bubble of clean air) with obvious beneficial therapeutic effects. This is a somatic line modification. If you then cloned a permanently genetically modified bone marrow cell from this individual, the modified genome would be passed to the clone and become part of his or her genome, transmissible to her offspring indefinitely through the germ line. Thus a benefit that would have perished with the original recipient and not been passed on for the protection of her children, can be conferred on subsequent generations by cloning.²⁵ The third effect is that it shows the oft asserted moral divide between germ line and somatic line therapy to be even more ludicrous than was previously supposed.¹⁵

Immortality?

Of course some vainglorious individuals might wish to have offspring not simply with their genes but with a matching genotype. However, there is no way that they could make such an individual a duplicate of themselves. So many years later the environmental influences would be radically different, and since every choice, however insignificant, causes a life-path to branch with unpredictable consequences, the holy grail of duplication would be doomed to remain a fruitless quest. We can conclude that people who would clone themselves would probably be foolish and ill-advised, but would they be immoral and would their attempts harm society or their children significantly?

Whether we should legislate to prevent people reproducing, not 23 but all 46 chromosomes, seems more problematic for reasons we have already examined, but we might have reason to be uncomfortable about the likely standards and effects of child-rearing by those who would clone themselves. Their attempts to mould their child in their own image would be likely to be more pronounced than the average. Whether they would likely be worse than so many people's attempts to duplicate race, religion and culture, which are widely accepted as respectable in the contemporary world, might well depend on the character and constitution of the genotype donor. Where identical twins occur naturally we might think of it as "horizontal twinning", where twins are created by nuclear substitution we have a sort of "vertical twinning". Although horizontal twins would be closer to one another in every way, we do not seem much disturbed by their natural occurrence. Why we should be disturbed either by artificial horizontal twinning or by vertical twinning (where differences between the twins would be greater) is entirely unclear.

Suppose a woman's only chance of having "her

own" genetic child was by cloning herself; what are the strong arguments that should compel her to accept that it would be wrong to use nuclear substitution? We must assume that this cloning technique is safe, and that initial fears that individuals produced using nuclear substitution might age more rapidly have proved groundless.²⁶ We usually grant the so called "genetic imperative" as an important part of the right to found a family, of procreative autonomy.²⁷ The desire of people to have "their own" genetic children is widely accepted, and if we grant the legitimacy of genetic aspirations in so many cases, and the use of so many technologies to meet these aspirations,²⁸ we need appropriately serious and weighty reasons to deny them here.

It is perhaps salutary to remember that there is no necessary connection between phenomena, attitudes or actions that make us uneasy, or even those that disgust us, and those phenomena, attitudes, and actions that there are good reasons for judging unethical. Nor does it follow that those things we are confident *are* unethical must be prohibited by legislation or regulation.

We have looked at some of the objections to human cloning and found them less than plausible, we should now turn to one powerful argument that has recently been advanced in favour of a tolerant attitude to varieties of human reproduction.

Procreative autonomy

We have examined the arguments for and against permitting the cloning of human individuals. At the heart of these questions is the issue of whether or not people have rights to control their reproductive destiny and, so far as they can do so without violating the rights of others or threatening society, to choose their own procreative path. We have seen that it has been claimed that cloning violates principles of human dignity. We will conclude by briefly examining an approach which suggests rather that failing to permit cloning might violate principles of dignity.

The American philosopher and legal theorist, Ronald Dworkin has outlined the arguments for a right to what he calls "procreative autonomy" and has defined this right as "a right to control their own role in procreation unless the state has a compelling reason for denying them that control".²⁹ Arguably, freedom to clone one's own genes might also be defended as a dimension of procreative autonomy because so many people and agencies have been attracted by the idea of the special nature of genes and have linked the procreative imperative to the genetic imperative.

"The right of procreative autonomy follows from any competent interpretation of the due process clause and of the Supreme Court's past decisions applying it. . . . The First Amendment prohibits government

from establishing any religion, and it guarantees all citizens free exercise of their own religion. The Fourteenth Amendment, which incorporates the First Amendment, imposes the same prohibition and same responsibility on states. These provisions also guarantee the right of procreative autonomy."³⁰

The point is that the sorts of freedoms which freedom of religion guarantees, freedom to choose one's own way of life and live according to one's most deeply held beliefs are also at the heart of procreative choices. And Dworkin concludes:

"that no one may be prevented from influencing the shared moral environment, through his own private choices, tastes, opinions, and example, just because these tastes or opinions disgust those who have the power to shut him up or lock him up."³¹

Thus it may be that we should be prepared to accept both some degree of offence and some social disadvantages as a price we should be willing to pay in order to protect freedom of choice in matters of procreation and perhaps this applies to cloning as much as to more straightforward or usual procreative preferences.³²

The nub of the argument is complex and abstract but it is worth stating at some length. I cannot improve upon Dworkin's formulation of it.

"The right of procreative autonomy has an important place . . . in Western political culture more generally. The most important feature of that culture is a belief in individual human dignity: that people have the moral right – and the moral responsibility – to confront the most fundamental questions about the meaning and value of their own lives for themselves, answering to their own consciences and convictions. . . . The principle of procreative autonomy, in a broad sense, is embedded in any genuinely democratic culture."³³

In so far as decisions to reproduce in particular ways or even using particular technologies constitute decisions concerning central issues of value, then arguably the freedom to make them is guaranteed by the constitution (written or not) of any democratic society, unless the state has a compelling reason for denying its citizens that control. To establish such a compelling reason the state (or indeed a federation or union of states, such as the European Union for example) would have to show that more was at stake than the fact that a majority found the ideas disturbing or even disgusting.

As yet, in the case of human cloning, such compelling reasons have not been produced. Suggestions have been made, but have not been sustained, that human dignity may be compromised by the techniques of cloning. Dworkin's arguments suggest that human dignity and indeed democratic

constitutions may be compromised by attempts to limit procreative autonomy, at least where greater values cannot be shown to be thereby threatened.

In the absence of compelling arguments against human cloning, we can bid Dolly a cautious "hello". We surely have sufficient reasons to permit experiments on human embryos to proceed, provided, as with any such experiments, the embryos are destroyed at an early stage.³⁴ While we wait to see whether the technique will ever be established as safe, we should consider the best ways to regulate its uptake until we are in a position to know what will emerge both by way of benefits and in terms of burdens.

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References and notes

- 1 The arguments concerning human dignity are developed in my Cloning and human dignity in *The Cambridge Quarterly of Healthcare Ethics* [in press]. The issues raised by cloning were discussed in a special issue of the *Kennedy Institute of Ethics Journal* 1994; 4,3 and in my *Wonderwoman and Superman: the ethics of human biotechnology*. Oxford University Press, Oxford 1992, especially ch 1.
- 2 Human embryo cloning reported. *Science* 1993; 262: 652–3.
- 3 Where few eggs can be successfully recovered or where only one embryo has been successfully fertilised, this method can multiply the embryos available for implantation to increase the chances of successful infertility treatment.
- 4 Wilmut I *et al.* Viable offspring derived from fetal and adult mammalian cells. *Nature* 1997; 385: 810–13.
- 5 Arlidge J. *The Guardian* 1997 Feb 26: 6.
- 6 Radford T. *The Guardian* 1997 Feb 28: 1.
- 7 WHO press release (WHO/20 1997 Mar 11).
- 8 WHO document (WHA50.37 1997 May 14). Despite the findings of a meeting of the Scientific and Ethical Review Group (see **Acknowledgements**) which recommended that "the next step should be a thorough exploration and fuller discussion of the [issues]".
- 9 UNESCO press release No 97-29 1997 Feb 28.

- 10 The European parliament. Resolution on cloning. Motion dated March 11 1997. Passed March 13 1997.
- 11 Perhaps the sin of Onan was to compromise the security of his genetic material?
- 12 Kahn A. Clone mammals . . . clone man. *Nature* 1997; **386**: 119.
- 13 For use of the term and the idea of "instrumentalization" see: *Opinion of the group of advisers on the ethical implications of biotechnology to the European Commission No 9*. 1997 28 May. Rapporteur, Dr Anne McClaren.
- 14 Kahn A. Cloning, dignity and ethical revisionism. *Nature* 1997; **388**: 320. Harris J. Is cloning an attack on human dignity? *Nature* 1997; **387**: 754.
- 15 See my *Wonderwoman and Superman: the ethics of human biotechnology*. Oxford University press, Oxford 1992: ch 2.
- 16 It is unlikely that "artificial" cloning would ever approach such a rate on a global scale and we could, of course, use regulative mechanisms to prevent this without banning the process entirely. I take this figure of the rate of natural twinning from Moore KL and Persaud TVN. *The developing human* [5th ed]. Philadelphia: WB Saunders, 1993. The rate mentioned is 1 per 270 pregnancies.
- 17 Of course if *all* people were compulsorily sterilised and reproduced only by cloning, genetic variation would become fixed at current levels. This would halt the evolutionary process. How bad or good *this* would be could only be known if the course of future evolution and its effects could be accurately predicted.
- 18 Mitochondrial DNA individualises the genotype even of clones to some extent.
- 19 Although of course there would be implications for criminal justice since clones could not be differentiated by so called "genetic fingerprinting" techniques.
- 20 Unless of course the nucleus donor is also the egg donor.
- 21 Margaret Brazier alerted me to this possibility.
- 22 Apparently Alan Trounson's group in Melbourne Australia have recorded this result. *The Herald Sun* 1997 Mar 13.
- 23 What mad dictators might achieve is another matter; but such individuals are, almost by definition, impervious to moral argument and can therefore, for present purposes, be ignored.
- 24 Except by Pedro Lowenstein, who pointed them out to me.
- 25 These possibilities were pointed out to me by Pedro Lowenstein who is currently working on the implications for human gene therapy.
- 26 Science and technology: *The Economist* 1997 Mar 1: 101-4.
- 27 *Universal Declaration of Human Rights* (article 16). *European Convention on Human Rights* (article 12). These are vague protections and do not mention any particular ways of founding families.
- 28 These include the use of reproductive technologies such as surrogacy and Intra Cytoplasmic Sperm Injection (ICSI).
- 29 Dworkin R. *Life's dominion*. London: Harper Collins, 1993: 148.
- 30 See reference 28: 160.
- 31 Dworkin R. *Freedom's law*. Oxford: Oxford University Press, 1996: 237-8.
- 32 Ronald Dworkin has produced an elegant account of the way the price we should be willing to pay for freedom might or might not be traded off against the costs. See his *Taking rights seriously*, London: Duckworth, 1977: ch 10. And his *A matter of principle*, Cambridge, Mass: Harvard University Press, 1985: ch 17.
- 33 See reference 27: 166-7.
- 34 The blanket objection to experimentation on humans suggested by the European parliament resolution would dramatically change current practice on the use of spare or experimental human embryos.